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ABSTRACT

How do more experienced school administrators think about and attend to problems in school administration? This paper presents findings of a study that compared how principals and aspiring principals cognitively processed and solved a problem scenario. A total of 30 practicing principals and 24 aspiring principals (referred to as the "novice group") were asked to give "think-aloud" responses to a hypothetical problem situation involving a school library. After the data were collected, participating principals were assigned to imputed-expertise groups using a battery of external measures. The sample included 28 females and 26 males. Findings indicate that principals in the high-expertise group attended to more of the sampled topic elements than did other principals and the novice subjects. Although there was no difference between the number of topics thought about by the novices and the principals who were not classified in the high-imputed expertise groups, the novices tended to focus on more peripheral topic elements than did the principals, who tended to concentrate on issues associated with library policy and operations. The emphasis was even more marked for high-expertise principals, who tended to think at greater length about the purpose of the library and library policy than did other principals. Additionally, the more expert principals considered topic elements that were generally ignored by their colleagues, such as the issue of staff disputes, book thefts, and budget concerns. The findings can be interpreted through the framework provided by schema theory, the more complex problem-relevant schemata of the principals acting to direct their attention to more central elements of the case, and the even more richly constituted schemata of the more expert principals. Six figures and three tables are included. (Contains 7 references.) (LMI)

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Paying attention: Content considered by experts and others when responding to a case problem.

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Paying attention: Content considered by experts and others when solving a case problem.

Grace Morfitt, Dawn Demaerschalk and Derek J. Allison

In an earlier paper, Allison & Allison (1993) observed that experts appear able to bring "both a broad and a close view to bear on problems and their solution [while] being able to look closely at and remain focused on constituent elements of a complex situation" (p. 305). They investigated these apparently contradictory abilities using data collected during our first principal problem processing [PPP] study. Principals' think aloud responses to a case study were rated for quality of response by several juries and were also independently analysed on several dimensions, one being the degree of attention or, as it was called by Allison and Allison, the density of attention paid to sampled elements of the case. In accord with the theory base outlined in the first paper prepared for the symposium of which this paper forms a part,[1] principals rated as having given higher quality responses to the case were expected to hold more complex schemata of schools and their administration. These richer, more multi-layered repositories of domain relevant knowledge would, it was reasoned, enable more expert principals to more readily link isolated pieces of information and recognize non obvious patterns in the case which, in turn, would allow them to attend to more elements of the case. Such a view is in accord with discussions of expert problem solving offered by several researchers and theorists (e.g. Berliner, 1986; Bereiter & Scardamalia, 1986; Reiman & Chi, 1989; VanLehn, 1989; Voss, *et al*., 1983) and was substantiated in the study.

In several ways, that study was the culmination of many previous efforts by members of our research team to devise reliable, meaningful, and hopefully powerful ways to analyse think-aloud protocols from the action domain of school leadership where the relevant practical knowledge appears less well organized and structured than it is in the domains where novice—expert studies were first pioneered. In this previous work, members of the current CASL project explored various approaches to analysing such think-aloud protocols, some of which were subsequently abandoned as being too cumbersome or inefficient. Work by our colleague Phil Nagy (1991) illustrated that the checklist approach can facilitate the identification of content attended to by subjects when thinking through a case problem. Allison and Allison built on this approach when devising the density analysis

[1] A list of the papers prepared for the symposium appears at the end of the reference list.

technique used in the 1993 study. The first step in this technique was to identify sample elements in the problem space relevant to possible solutions paths through the space. Think aloud transcripts were then scored for whether or not subjects heeded these selected elements, and the level of attention paid to them. In the analysis reported in the 1993 papers, transcripts were scored by awarding one point if a subject mentioned or referred to a sampled element, another point if the element was discussed or considered in some way in the transcript, and a third point if the transcript contained evidence that a subject had addressed or somehow incorporated the element into his or her proposed solution path. Results revealed a direct correlation between subjects' overall quality of response scores obtained from the jury ratings and "higher levels of attention to detail in terms of mentioning, considering, and attending to specific elements of the case problem." (Allison & Allison, 1993, p. 314)

Method

The main objective of the study reported here was to continue the line of inquiry outlined above by investigating similarities and differences in the case elements considered by true novices and practising principals, male and female participants, and principals judged as having higher and lower levels of imputed expertise. As discussed at some length in the companion papers dealing with our theory base and the study design, the 24 members of the true novice group recruited for the study were all non principals and, indeed, were individuals who were unlikely to have been socialized to the adult work culture of schools. This was in accord with results from our first PPP study which led us to conclude that

> experience as a principal did not by itself produce a significant difference in rated responses to the case and other measures examined, but experience in schools did. This implies that experienced teachers preparing to assume the principalship should not be assumed to qualify as novices in the domain of school administration, which is an important finding for the design of future studies. (Allison & Allison, 1993, p. 317)

The 31 principals who participated in the current study were all volunteers, no attempts being made to recruit subjects according to either experience or reputed expertise. While, as recognized by Kennedy (1987), "expertise evolves and develops with experience," she also cautions that time-in-role does not, by itself, ensure expertise. We found this to be so in our first PPP study where we had taken pains to recruit principals across a range of experience categories on the assumption that this would serve as a rough proxy for expertise. No clear relationship was found, however, between experience as a principal and the judged quality of responses to the case problem. In

the current study, then, principals were recruited solely on their basis of willingness to participate. As discussed at length in the accompanying design paper, participating principals were assigned to imputed expertise groups after all data collection activities had been completed using a battery of external measures, including ratings by supervisors and school staff, staff assessments of school effectiveness, and the ratings of the think-aloud transcript from a peer jury. By applying a set of decision rules to these data, principals were classified into one of three categories of imputed expertise, High (N=6), Medium (N=19) or Low (N=5).

All participants were asked to give think aloud responses to a modified version of the Miss MacDonald case used in the first PPP study. The case concerns the arrival of a new principal, Pat Jones, at Sugar Maple elementary school. Pat notices some inferior aspects of the library and arranges a conference with Miss MacDonald, who has served as the school's teacher-librarian for the past fifteen years, but has recently expressed a desire to transfer to classroom teaching. Before the meeting Pat becomes aware of information about Miss MacDonald and the library. Specifically, Ms. Green, a first year teacher with a grade seven class speaks to Pat about the library, and discussions with other staff suggest the library is not well used. When she meets with Pat, Miss MacDonald declares that apart from the theft of some books and other similar concerns, there is nothing wrong with the library and she intends to continue with established practices. A shortened version of this case was used in the current study, several elements being omitted from the version used in the first study on the recommendation of the jury of reputationally expert principals that reviewed the TA transcripts in the earlier study.

Following a recommended brief training session in the think-aloud process (Ericsson & Simon, 1984), subjects were handed the case study and asked to read it aloud, interjecting their thoughts as they read, and were then encouraged to think out loud about how Pat Jones should proceed. Once they had finished, they were asked to recall their thought processes and reflect on how they had reacted to the case. Sessions were audio-taped and verbatim transcripts prepared. Identifying information was removed from the transcripts, and each was assigned a random identification number. The total data set analysed consisted of 55 responses to the case problem, 30 from principals and 24 from the true novice group, one think aloud session from each group having been lost due to machine malfunctions. One notable feature of this dataset is the similar number female (N=-28) and male (N=26) subjects. Even though there is a disproportionate number of females in the novice group and males in the principal group, the balance provides an valuable opportunity for investigating gender effects.

Data preparation and analysis

To facilitate and standardize coding, each transcript was first divided into numbered "thought units." In his informative discussion of transcript analysis, Weber (1990) identifies six commonly used analytical units, namely word, word sense, sentence, theme, paragraph and whole text. Of the sentence, Weber writes:

> An entire sentence is often the recording unit when the investigator is interested in words or phrases that occur closely together. It is sometimes more helpful to break long, complex sentences down in to shorter thematic segments. Although this form of coding is labor-intensive, it leads to much more detailed and sophisticated comparisons. (p.21)

Referring to Holsti (1963, p. 136), Weber accepts the theme as "a unit of text having no more than one each of the following elements: (1) the perceiver, (2) the perceived action or agent of action, (3) the action, and (4) the target of action." Guided by these observations, the first and second authors independently chunked the transcripts into thematic thought units, some of which were sentences, but many of which were parts of sentences. Ten transcripts were processed at a time, with the independently derived results being compared and consensus reached before the next set of transcripts were reviewed. Inter-rater reliability for the first set of transcripts was just under 60%, reflecting initial differences in interpretation of what constituted a thought unit. Once these initial differences were resolved by agreeing that the sentence clause was the most accurate guide to isolating thought units, inter-rater agreement rose, stabilizing at around 88%. All remaining disagreements were discussed to consensus.

Each thought unit [TU] was numbered. The transcripts were then re-read by the first and second authors to assign each constituent TU to one or more of 28 pre-selected topic elements from the case problem. TUs that could not be classified as being concerned with any of these case elements were assigned to a residual, "Not Coded" category. Each of the topic elements used to classify the TUs represents a potentially relevant node in the problem space to be traversed when thinking through the situation described in the case. The topic elements considered are listed in the left hand column of Table 1. The Tables also shows how the *elements* (shown in normal font) were grouped into six more inclusive topic *areas*, namely Miss MacDonald, Library, Staff, Specifics, Generic concerns and Principal's role, shown in left justified bold font in the Table. The Miss MacDonald topic area contains six specific topic elements, these being Miss MacDonald's role, needs, skills, leadership, future and [personal] agenda, the Library topic area subsumes five elements, Library purpose, resources, schedule, and so forth. Some of the topic elements are specifically mentioned in the case. In the Library topic area, for example, the

PtA Policy element—which refers to the *Partners in Action* policy document applying to elementary school library philosophy and operations in Ontario—is specifically mentioned. All of the constituent elements of the Specifics topic area were also directly identified in the case, but would not necessarily be considered as central issues or concerns when searching for a solution path. Other topic elements, such as Miss MacDonald's skills and the purpose of the library were not specifically mentioned in the case, but are potentially relevant to the situation as described. Some other elements not specifically identified in the case, such as program and budget in the Generic concerns topic area, have a less obvious relevance but are nonetheless pervasive to school leadership and administration and as such would likely be considered—at least by proficient principals—when exploring possible courses of action. The first five topic areas shown in Table 1 and all but two of their constituent topic elements were initially used in the density analysis reported in the 1993 Allison and Allison paper. The two exceptions are the topic elements of Miss MacDonald's agenda and Staff disputes which were not included in the earlier analysis. The sixth topic area of Principal's role was also not used in the previous study. We had originally intended to include this new topic as an element in the Generic concerns area, but eventually decided to treat it as a topic area in some of the analyses reported below due to the high proportion of TUs coded in this category. Even so, it should be borne in mind that unlike the other topic areas considered, the Principal's role area has only one constituent topic element. Furthermore, it should be noted that Principal's role is included in the total of 28 discrete topic elements coded in this study, and is thus treated as a topic element in some analyses but as a topic area in others.

A key methodological difference between the analyses reported in this paper and those conducted for the 1993 study needs to be stressed. The earlier study sought to identify whether a given topic element attracted the attention of subjects as they thought through the problem and, if it did, an attempt was made to estimate the degree of attention given to the element. When a think aloud transcript referred to one of the topic elements, this was checked off on a coding sheet. If the comment in question or a subsequent statement presented evidence that the subject had thought about the element beyond simply mentioning it, then a second check mark was added to the coding sheet, a third check mark being made if the transcript included reference to some relevant action about the element. In essence, then, our 1993 density analysis was based on a holistic interpretation of the transcripts. In contrast, the analyses conducted in the current study sought to classify each of the pre-determined TUs into one or more of the sampled case elements. We reasoned that this method would provide a more complete account of the

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relative attention given to topic elements which, in addition to identifying elements which were not considered by subjects, would also identify where subjects tended to concentrate their attention, and whether they fixated on certain topics. To distinguish this method from the density analysis reported in the earlier paper we call this more inclusive method "topical attention analysis." The advantage of this approach is that it produces a more accurate and complete account of how often, if at all, the pre-selected topical elements are mentioned in the transcripts. The disadvantage—at least when compared to the density analysis technique—is that it does not incorporate a means of identifying the degree or type of attention paid to these elements as subjects worked on the problem. Thus, while this approach made it possible to conclude, for example, that ten percent of the TUs in a transcript made reference to a given topical element, it did not allow us to reach any reliable conclusions about the level of cognitive processing involved. We did initially attempt to incorporate this into the analysis, but when we found we could not reliably apply or adapt the previously used mentioned, considered and addressed levels of attention to individual TUs we abandoned this attempted refinement in favour of the more sophisticated analysis of cognitive processing reported in the fourth paper prepared for this symposium. In consequence, the topical attention analysis reported in this paper deals primarily with the content considered in the transcripts as sampled by the pre-selected topical elements described above. The process of classifying the numbered TUs against topical elements had the added advantage of facilitating retrospective qualitative analysis, as illustrated later in this paper.

The topical content of the thought units was coded independently by the first and second authors in sets of ten, results being compared and any necessary adjustments made before moving to the next batch of transcripts. As noted earlier, each transcript had been assigned a random identification number and each set of transcripts was compiled according to the sequence of these numbers, which effectively mixed together and helped disguise subject identity and group membership. Coding was conducted by recording the number of the appropriate TU on a coding sheet alongside the topical element to which it appeared to most directly refer. Early tabulations of inter-rater reliability demonstrated only 60% agreement between the two coders. On investigation it was found that the majority of disagreements involved statements in which there were references to two or more topic elements in the thought unit. Consequently, we decided to assign thought units to more than one category if this was warranted. Once the multiple classification procedure was in place, levels of agreement rose to and remained at an overall average of 75% across all topic areas. Final consensus was reached for every statement coded prior to entering the

data for analysis. Initial disagreements in assigning TUs to topic elements occurred primarily when those statements were somewhat vague in their specific reference to an element. In those instances, a review of the statements leading up to the one in question often reconciled the difference.

Once all of the 54 transcripts from the second round of data collection were coded, we then coded the 38 Miss MacDonald transcripts from the first PPP study with the intent of pooling the data for analysis. Unfortunately, initial analysis revealed that the modifications made to the wording of the case study for the current round of data collection introduced a number of systematic differences which precluded pooling the data. It appears that some of the subjects in the first PPP study paid a great deal of attention to aspects of the case which were removed from the version of the case used in the second study. We are considering re-coding the first study data to adjust for this. At the same time, the differences between the two datasets offer interesting and potentially important opportunities for additional analysis. Given that the elements we removed from the case for the second round study were identified by a panel of reputationally expert principals as being peripheral to the main problem, then the degree to which subjects in the first study became preoccupied with these elements should correlate negatively with expertise. We hope to explore this in future work.

Findings

Transcript length and number of thought units

Considerable variation was evident in the length of the transcripts, as illustrated in Figure 1 which plots the number of TUs per transcript against total number of words in each transcript of the concurrent think aloud sessions. The box plots shown on the margins of the Figure indicate the median and quartile points for each distribution. In both cases the distributions tail upwards, but not excessively so, the median number of words per transcript being 553, the maximum 1,732, and the median number of TUs 35.5, the maximum 97. Logically, and as would be anticipated from the scatter plot, there is a high correlation between number of words and TUs, $r = .922$, $p < .0001$. The symbols used to plot data points distinguish between transcripts from Principals and Other (true novice) subjects. No patterned relationship is evident, as was confirmed by a two-way ANOVA for the effects of participant Group and Gender, F being < 1 in both cases with no significant interaction. In other words, both

practising principals and novice subjects were just as likely to have given longer or shorter responses to the case problem. This is conveniently illustrated in Figure 1 by the two transcripts with the highest word counts, one of which was from a principal and the other from a non-principal, and by the three transcripts with the lowest word count, one of which was from a principal and two from subjects in the true novice group.

When the principal transcripts were considered separately, both number of words and number of TUs were found to be related to the imputed level of expertise amongst principals, as illustrated in Figure 2. The internal lines appearing on this plot show the upper and lower quartiles of the distributions. Three of the six transcripts from principals classified in the High imputed expertise category appear in the top right sector of the plot as defined by the 75th percentiles lines, two of the remaining three falling on or close to the upper quartiles, the remaining High expertise transcript falling approximately in the middle of both distributions. Two way ANOVAs for imputed expertise and gender yielded significant effects for imputed expertise on both total words ($F[2,24] = 3.64$, $p. = .042$) and number of TUs ($F(2,24] = 5.12$ $p. = .014$) with no significant interaction. A

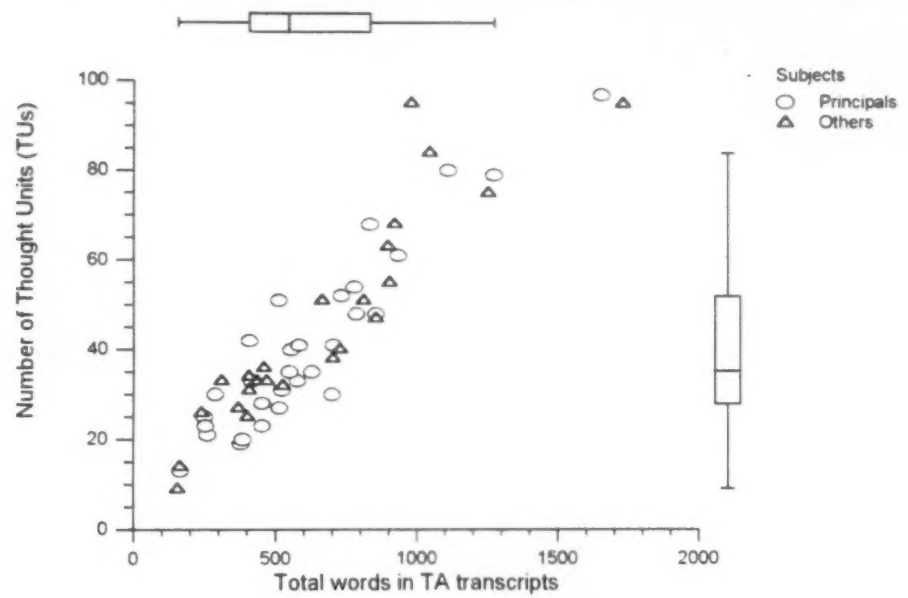

Figure 1

Scatter plot of number of thought units against number of words in transcripts

multiple comparison test identified the High imputed expertise group as being significantly different from the Medium and Low groups (Bonferroni, $p < .05$). Even so, Figure 2 clearly shows that transcripts from two principals classified in the Medium expertise group fell into the upper quartiles of both distributions, while five of the six transcripts falling below the 25th percentile on both distributions also belonged to principals classified into the Medium expertise category, the sixth belonging a principal in the Low imputed expertise group. Thus, while principals classified into the High imputed expertise group generally talked at greater length when responding to the case problem, so did some principals classified in the Medium expertise category. Moreover, brevity of response was not necessarily associated with a Low level of imputed expertise.

Case elements considered

By focusing on the number of TUs referring to the sampled case elements, the analyses conducted in the current study did not yield data directly comparable to the density of attention measure used in the earlier Allison and Allison (1993) study. We sought to compensate for this by counting the number of different topic elements addressed by at least one TU in each transcript. This provides a measure of the total number of case elements

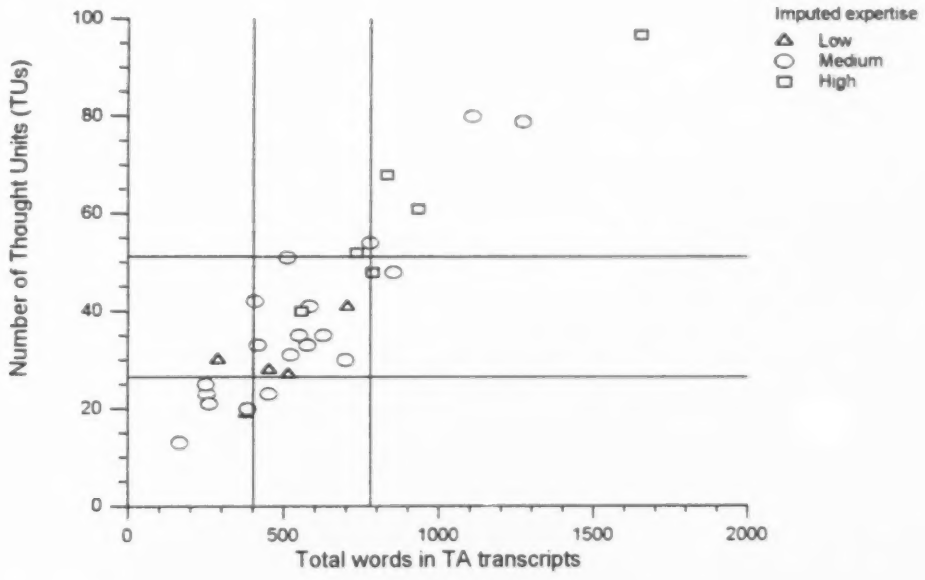

Figure 2

Thought units and total words for principal transcripts showing imputed expertise categories

attracting the attention of subjects in their think aloud responses or, as it will be called here, the *coverage* of the sampled topic elements in the TA responses. Subtracting this measure from the total of 28 sampled topic elements yields the reciprocal number of topic elements ignored by respondents in their think aloud responses, which is a more meaningful indicator in some respects. Figure 3 shows box plots of topic coverage by subject group, the horizontal line across the middle of the plot marking the median of 11.5 topic elements covered in the total distribution. Five groups are plotted, the pre-novice Naive subjects, the Novice B Ed student subjects and the principals as assigned to the three imputed expertise categories. Three main points emerge from the data display. First, there is a large range in the number of topics mentioned in at least one TU across the full dataset, the minimum number of topics covered in the TA responses being five (one Naive and one Medium expertise transcript), and the maximum 22 out of the 28 topics sampled (in a High expertise transcript). Second, no marked differences are evident between the number of case elements covered by true novices and by principals in the Medium and Low imputed expertise categories. The median lines for all four of the respective box plots are clustered close to the median for the total distribution with relatively little variation in the spread of either the

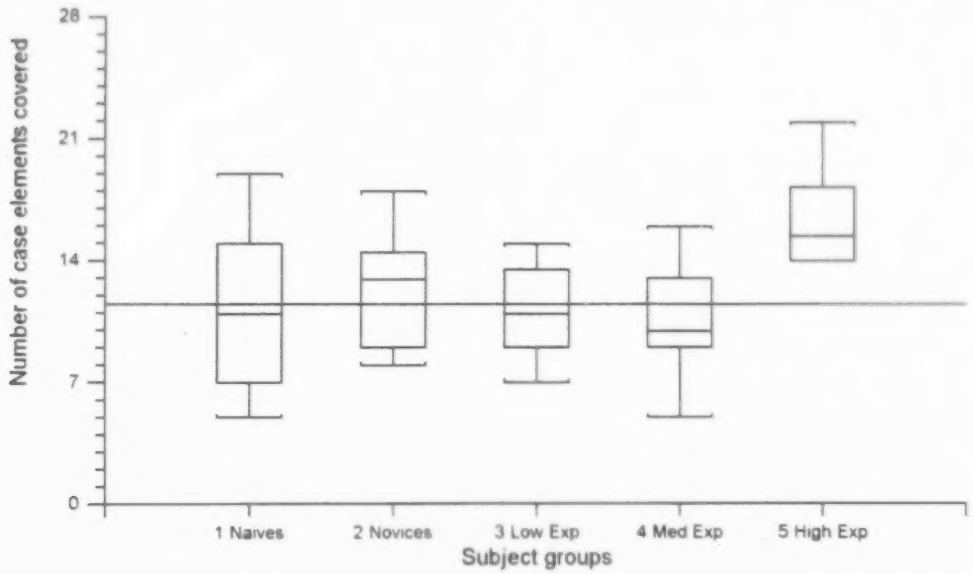

Figure 3

Box plots of total number of topic elements mentioned by subject group

central boxes marking the interquartile ranges, or the 'T' bars marking the 10th and 90th percentiles. Third, and in sharp contrast, the box plot for the principals classified in the High imputed expertise category shows that they covered a markedly higher number of topic elements than did subjects in the other participant groups. None of the transcripts from principals in the high expertise group were coded as covering less than 14 topic elements. Expressed another way, whereas most of the respondents in the other subject groups, including the other principals, ignored 50 per cent or more of the case elements coded, all of the principals in the High imputed expertise group talked about 50 per cent or more of the coded topic elements. A one-way ANOVA confirmed the pattern shown in Figure 3, principals in the High expertise group being coded as having covered a significantly higher number of sampled case elements (mean=16.4) than their colleagues in the Medium (mean=10.9) or Low (mean=11.2) imputed expertise categories, and the respondents in the Novice (mean=12.4) and Naive groups (mean=11.4) [$F(4,49) = 2.93$, $p = .029$]

Topical attention analysis: Principals and other participants

While the results reviewed above show that principals in the High imputed expertise group thought about more topic elements than other subjects, the more interesting questions of which elements were considered and at what length remains. The investigations of these questions reported in this section were based on the percentages of total thought unit codings assigned to the 28 topic elements in order to facilitate comparisons of the relative proportion of attention paid to topic elements and areas. Table 1 presents summary and comparative statistics for the total dataset and for principals and other subjects and for males and females. The five columns comprising the main body of the Table show the mean percentage of total thought unit codings together with associated standard deviations (in brackets). Selected test statistics from two way ANOVAs for participant Group and Gender are shown in the three columns to the right of the Table. The first of these columns shows probabilities associated with the two way F ratios. Probabilities that did not approach .05 are omitted, indicating that no further analyses were undertaken. In several cases probabilities in excess of .05 are reported. These were retained in the Table because subsequent multiple comparison procedures [MCP] identified single factor effects at an alpha level of .05. The second ANOVA column reports whether or not there was a significant interaction between Group and Gender. The third reports whether or not *post hoc* MCPs at alpha .05 identified statistically significant differences between

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Table 1

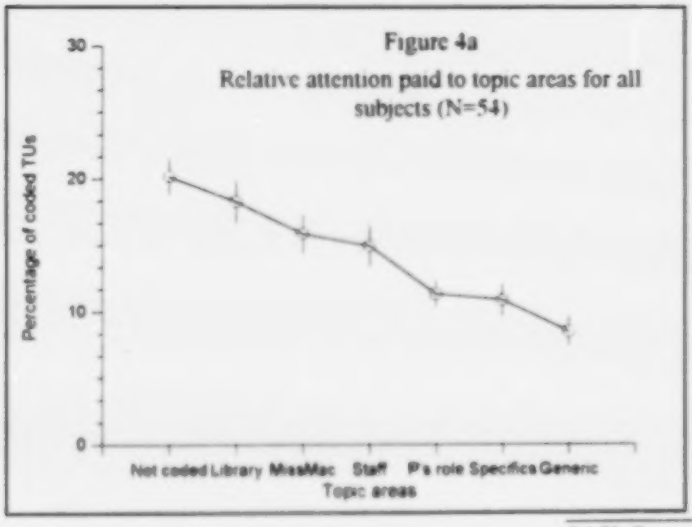
Relative attention paid to topic elements and areas by participant Group and Gender

Topic Areas and elements	All Ss	Participant Group		Gender		Two way		
		Principals	Others	Male	Female	ANOVA Statistics		
	N=54	N=30	N=24	N=25	N=28	*p*	Interaction	MCP
Miss MacDonald	**15.9 (10.6)**	**16.5 (12.2)**	**15.2 (8.4)**	**16.1 (12.0)**	**15.7 (9.5)**	—	—	
Role	4.9 (4.8)	4.8 (4.9)	5.0 (4.9)	5.3 (5.6)	4.5 (4.2)	—	—	
Needs	4.5 (4.5)	3.5 (4.1)	5.8 (4.9)	2.6 (2.8)	6.3 (5.1)	.013	None	✓
Skills	3.4 (6.3)	5.1 (7.9)	1.1 (2.0)	5.0 (7.6)	1.8 (4.5)	.063	None	✓
Leadership	0.5 (1.9)	0.4 (1.3)	0.7 (2.6)	0.9 (2.7)	0.2 (0.7)	.047	.041	✗
Future	2.0 (3.0)	2.2 (3.0)	1.8 (2.9)	1.8 (2.6)	2.2 (3.3)	—	—	
Agenda	0.6 (1.5)	0.4 (1.0)	0.8 (2.0)	0.4 (1.0)	0.8 (1.9)	—	—	
Library	**18.3 (11.6)**	**22.3 (12.2)**	**13.3 (8.8)**	**17.5 (10.0)**	**19.1 (13.1)**	.002	None	✓
Purpose	6.8 (6.2)	7.7 (6.4)	5.8 (6.0)	7.3 (6.6)	6.5 (6.0)		—	
Resources	3.9 (5.7)	3.3 (5.0)	4.6 (6.5)	3.5 (5.2)	4.2 (6.1)	—	—	
Schedule	2.0 (5.3)	2.9 (7.0)	0.8 (1.4)	1.6 (3.1)	2.4 (6.8)	—	—	
PtA Policy	4.9 (7.1)	7.8 (8.2)	1.2 (2.3)	4.5 (6.6)	5.3 (7.6)	.002	None	✓
Facilities	0.7 (2.0)	0.6 (1.8)	0.9 (2.2)	0.7 (1.4)	0.7 (2.4)	—	—	
Staff	**14.9 (11.2)**	**13.3 (10.6)**	**17.0 (11.9)**	**11.8 (10.7)**	**17.8 (11.0)**	.068	None	✓
As a whole	4.1 (5.8)	4.3 (6.6)	3.9 (4.7)	3.8 (6.6)	4.4 (5.1)	—	—	
Individuals	1.6 (2.4)	2.0 (2.8)	1.1 (1.9)	1.6 (2.5)	1.7 (2.5)	—	—	
Needs	2.5 (3.2)	2.2 (2.9)	2.9 (3.6)	1.7 (2.7)	3.3 (3.5)	.052	None	✗
Prof. Development	0.6 (1.8)	1.1 (2.3)	0.1 (0.4)	0.5 (1.3)	0.76 (2.2)	.031	None	✓
Involvement	3.1 (7.1)	1.6 (2.5)	5.0 (10.1)	1.4 (2.9)	4.7 (9.3)	—	—	
Disputes	3.0 (4.5)	2.1 (2.7)	4.0 (5.9)	2.9 (3.9)	3.0 (5.0)	—	—	
Specifics	**10.9 (8.8)**	**8.2 (6.0)**	**14.3 (10.6)**	**11.1 (10.1)**	**10.7 (7.6)**	.005	None	✓
MM's Transfer	4.1 (5.0)	3.5 (4.1)	4.8 (5.9)	4.5 (6.0)	3.7 (3.9)	—	—	
Ms. Green	3.2 (5.3)	1.8 (3.6)	4.1 (6.5)	3.1 (5.4)	3.4 (5.3)	.022	None	✓
Assistant blow-up	1.2 (2.6)	0.6 (1.3)	1.9 (3.5)	1.4 (3.0)	1.0 (2.1)	.026	None	✗
Book thefts	1.2 (2.4)	0.9 (1.9)	1.6 (2.8)	1.4 (2.9)	1.1 (1.8)	—	—	
Preparation time	1.2 (3.0)	1.3 (3.2)	1.0 (2.6)	0.8 (2.8)	1.5 (3.0)	—	—	
Generic concerns	**8.5 (8.3)**	**8.3 (8.7)**	**8.7 (7.9)**	**9.6 (9.2)**	**7.4 (7.3)**	—	—	
Students	3.7 (4.9)	2.2 (3.1)	5.6 (6.0)	3.9 (5.7)	3.5 (4.1)	.003	.011	✓
Program	0.6 (1.5)	0.8 (1.9)	0.3 (0.7)	0.4 (0.9)	0.7 (1.9)	—	—	
Budget	1.5 (3.0)	1.4 (3.1)	1.7 (3.0)	1.7 (3.3)	1.4 (2.7)	—	—	
External aid	1.3 (2.6)	1.7 (3.1)	0.7 (1.8)	1.8 (4.2)	0.8 (2.1)	—	—	
Time-lines	1.5 (3.4)	2.2 (4.1)	0.6 (2.0)	1.8 (4.3)	1.2 (2.4)	—	—	
Principal's role	**11.4 (7.7)**	**11.5 (7.9)**	**11.1 (7.5)**	**13.2 (7.9)**	**9.6 (7.1)**	—	.039	✗
Not Coded	**20.2 (9.0)**	**20.0 (8.3)**	**20.5 (11.2)**	**20.8 (6.8)**	**19.7 (11.7)**			

group means. Where such differences were supported, the means in question are highlighted with a shaded background in the main body of the Table. Thus, the shading in the participant Group column for the relative percentage of attention paid to Miss MacDonald's skills indicates an MCP confirmed statistically significant difference between the means, with no interaction with Gender. In this particular case, the analysis presented several complexities. As shown in the Table, the two-way F ratio had an associated probability greater than .05, but both Bonferroni and Fisher's LSD MCP identified the Principal response group as being statistically different from the Other group at the .05 level. Even so, the principal responses were heavily skewed, suggesting the influence of other factors and undermining ANOVA normality assumptions. Subsequent analysis suggested that differences related to imputed expertise were exerting a distorting effect. Be that as it may, the marked difference between the percentage attention means of the principals (5.1%) and the other subjects (1.1%) encouraged us to report the significant difference shown in Table 1.

Figures 4a, 4b & 4c are intended to assist in interpreting the patterns and differences in and between the summary statistics reported in Table 1. These Figures show error bar plots for the relative frequency with which TUs were coded into topic areas, the symbols in the charts plotting mean percentages and the lines extending above and below the symbols showing the standard error. Figure 4a charts the percentage of coded TUs in topic areas for all 54 transcripts, ranked from the most to least frequently coded areas, thus providing a baseline pattern for interpreting the other charts in this sequence. The Figure shows that the largest proportion of TUs were assigned to the residual Not Coded category, meaning that they were not considered to refer to any of the selected case elements. Many of the TUs classified in this category were comments not directly relevant to the case problem, such as, "Ok, so I'll answer this as if I were Pat." but others referred to topics not sampled in the analysis. Precise percentages for each topic area can be read from the "All Ss" column in Table 1. In all topic areas except the Not Coded and

Figure 4a
Relative attention paid to topic areas for all subjects (N=54)



Principal's Role categories, the relative attention percentages were calculated by summing the percentages for the topic elements contributing to that area, and thus the relative contribution of constituent topic elements to each topic area can also be ascertained by consulting Table 1. Thus, of the 18.3% of TUs coded in the Library topic area, 6.8% were coded as referring to the purpose of the library, 4.9% to the Partners in Action element and 3.9% to library resources. On one interpretation, the relative attention paid to topic areas could be seen as reflecting the centrality of issues in the problem, moving from the Library topic area, to the librarian Miss MacDonald, to the Staff, and then to elements subsumed by the Specific and Generic areas.

Figure 4b illustrates the relative attention paid to topic areas by Principals and the true novice Other participants. In the Figure, the mean percentages of coded TUs for the Principals are plotted with a triangle symbol, and for Other subjects with a square symbol. Connecting lines are shown to aid interpretation. Two substantial differences between the topic areas attended to by the two subject groups are clearly portrayed in the plot. Principals paid significantly greater attention to topic elements in the Library area (22.3%) than did the Other subjects (13.1%), while the Other (14.3%) subjects gave significant greater attention to topics in the Specific area than did the Principals (8.2%). Examination of Table 1 shows that the greater attention paid by Principals to the Library area is mainly attributable to the significantly higher proportion of TUs coded as referring to the PiA Policy element and the greater (but not significant) attention paid to the purpose of the Library. Table 1 further shows that the greater attention paid to case Specifics by the novice subjects is largely accounted for by the significantly higher proportion of TUs which they devoted to the Ms. Green topic element (a walk-on character in the case) and a briefly mentioned incident concerning a "blow-up" between Miss MacDonald and a library assistant. In both of these cases the novice subjects appeared to regard these incidents as

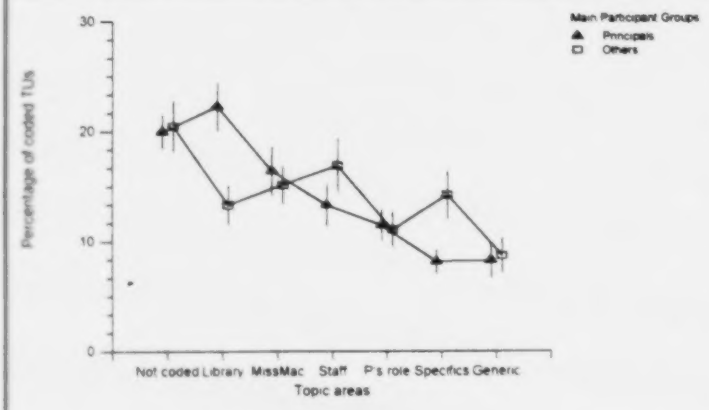


Figure 4b
Relative attention paid to topic areas by principals & others

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sources of potentially valuable information, whereas most Principals (not all, as will be discussed below) tended to ignore these incidents.

Two other significant differences between the topic elements attended to by Principals and the Other subjects are highlighted in Table 1, but are not evident in Figure 4b, these effects being cancelled out by cumulative variations in the other elements in the topic areas. The first is the significantly greater attention paid to the Miss MacDonald's skills by the Principals as a whole. This was a particular concern for many Principals, but did not attract similar levels of attention from the Other subjects. The second difference concerns the significantly higher level of attention directed by the Other subjects to the Generic topic element of students. This was one of the few instances where a significant interaction was found between participant Group and Gender. Examination of the ANOVA MCP statistics showed that as a group the male Other subjects were coded as having directed a significantly greater proportion of their TUs (9.56%) towards students than any of the other combinations of Group and Gender. One final point from Figure 4b concerns changes in the relative ranks of topic areas from the overall pattern shown in Figure 4a. Leaving aside the Not Coded category, the Principals divided their attention to the topic areas in the same order (although at different relative magnitudes) as plotted in the Figure 4a, most attention being devoted to the Library, the next most to Miss MacDonald, and so forth. The overall pattern for the Other subjects has a notably different emphasis, most attention being paid to the Staff area, followed by Miss MacDonald, case Specifics, the Library, the Principal's role, and then Generic concerns.

Figure 4c portrays the pattern of attention paid to topic areas by male (plotted with triangles) and female (plotted with circles) subjects. This chart omits the connecting lines between the plotted means so as to reduce clutter. The chart shows a clear and notable difference between the mean level of attention paid to the Staff topic area by male and female subjects. The detailed statistics in Table 1 show that while the F ratio from the two-way ANOVA failed to attain significance at the .05 level, MCPs identified the female subject group responses as being distinct from the male group (Bonferroni & Tukey-Kramer, $p < .05$). In this instance, nonetheless, the graphical portrayal of the difference between the mean scores is eloquent. Inspection of the topic element data for the Staff area in Table 1 shows that the mean difference is largely accounted for by higher levels of attention paid by female participants to involving staff members, thinking about the Staff as whole, and about Staff needs.

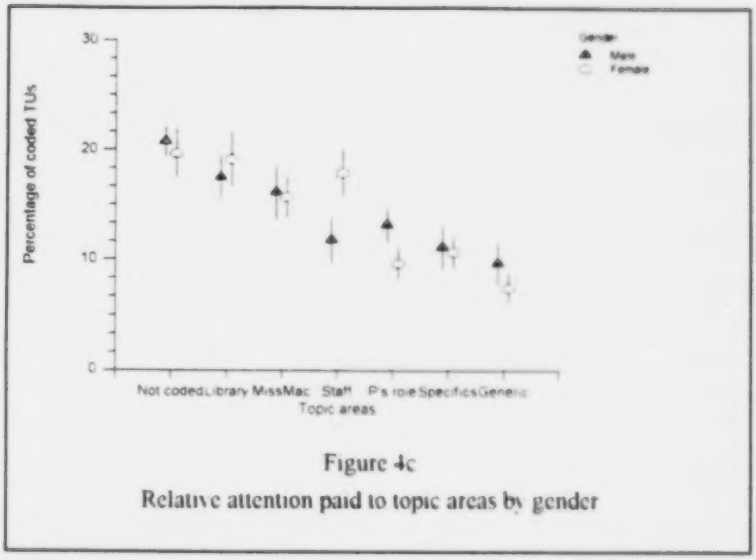

Figure 4c
Relative attention paid to topic areas by gender

Figure 4c identifies TUs coded as being concerned with the Principal's role as another possible gender related difference, males apparently having paid more attention (13.2%) to this aspect of the case than females (9.6%). As suggested by the significant interaction reported in Table 1, the differences identified in the ANOVA MCP turned out to be more complex than suggested by the chart, with Gender apparently exerting an amplifying effect for the Principal group, male Principals being coded as having directed a significantly greater proportion of their TUs (14.3%) to aspects of the Principal's role in the case than did female Principals (6.69%) (Tukey-Kramer, $p < .05$)

Topical attention analysis: Principals and imputed expertise

Table 2 summarizes results of the topical attention analysis for the 30 principals across the three imputed expertise categories using similar data display conventions to those described for Table 1. In this case, the ANOVA statistics are for one-way tests, the MCP column indicating differences identified between means for the three imputed expertise categories. The unbalanced number of subjects in the three categories makes both the application and interpretation of the ANOVA statistics problematic. Several graphical data displays are used in the following discussion to help compensate for this. The first of these, Figure 5, is an error bar chart plotting means for imputed expertise groups against topic areas.

Table 2 reports no statistically significant differences across the imputed expertise groups on the topic areas plotted in Figure 5. The Figure nonetheless contains more than a few points of interest. First, principals in the high expertise group had markedly fewer TUs in the not coded category, the short span of the error bars showing there was little variation in this respect within the group, even though it contains only six subjects. More

Table 2

Summary statistics for percentage of coded TUs by imputed expertise categories

	Imputed Expertise Categories						
Topic Areas and	All Principals	Low	Medium	High	ANOVA Statistics		
elements	N=30	N=5	N=19	N=6	F (2,27)	*p*	MCP
Miss MacDonald	**16.5 (12.2)**	10.3(4.5)	19.1 (14.3)	13.3 (6.2)	1.28	0.29	
Role	4.8 (4.9)	3.4 (3.4)	5.6 (5.3)	3.6 (4.7)	0.61	0.55	
Needs	3.5 (4.1)	2.6 (4.2)	4.3 (4.4)	1.8 (2.0)	0.97	0.39	
Skills	5.1 (7.9)	2.3 (2.2)	6.2 (9.1)	4.2 (6.8)	0.49	0.62	
Leadership	0.4 (1.3)	0	0.5 (1.5)	0.5 (0.8)	0.31	0.74	
Future	2.2 (3.0)	2.0 (4.5)	2.1 (3.1)	2.5 (1.5)	0.05	0.95	
Agenda	0.4 (1.0)	0	0.5 (1.2)	0.6 (1.0)	0.56	0.58	
Library	**22.3 (12.2)**	23.2 (3.1)	20.8 (14.5)	26.3 (8.4)	0.46	0.64	
Purpose	7.7 (6.4)	7.4 (6.1)	6.4 (5.9)	12.1 (7.9)	1.82	0.18	
Resources	3.3 (5.0)	4.5 (4.1)	2.9 (5.5)	3.7 (4.3)	0.21	0.82	
Schedule	2.9 (7.0)	3.2 (2.0)	3.3 (8.7)	1.4 (1.9)	0.16	0.85	
PtA Policy	7.8 (8.2)	6.4 (4.7)	7.1 (9.1)	8.9 (8.7)	0.13	0.88	
Facilities	0.6 (1.8)	1.8 (2.4)	0.4 (1.9)	0.2 (0.4)	1.28	0.3	
Staff	**13.3 (10.6)**	14.2 (11.9)	12.6 (11.2)	15.1 (8.4)	0.14	0.87	
As a whole	4.3 (6.6)	5.6 (7.6)	3.6 (7.0)	5.3 (5.7)	0.24	0.79	
Individuals	2.0 (2.8)	2.1 (3.3)	2.1 (2.8)	1.7 (3.0)	0.06	0.94	
Needs	2.2 (2.9)	1.7 (2.4)	2.7 (3.4)	1.1 (1.6)	0.79	0.46	
Prof. Development	1.1 (2.3)	2.7 (4.4)	0.6 (1.6)	1.0 (1.9)	1.73	0.2	
Involvement	1.6 (2.5)	1.3 (1.8)	1.7 (2.9)	1.5 (1.9)	0.05	0.95	
Disputes	2.1 (2.7)	**0.8 (1.7)**	**1.7 (2.6)**	**4.5 (2.5)**	**3.86**	*0.04*	H > ML
Specifics	**8.2 (6.0)**	5.8 (5.1)	7.6 (6.5)	12.0 (3.7)	1.74	0.2	
MM's Transfer	3.5 (4.1)	3.0 (2.9)	2.9 (4.5)	5.8 (3.4)	1.18	0.32	
Ms. Green	1.8 (3.6)	0	2.6 (4.3)	1.0 (1.5)	1.24	0.3	
Assistant blow-up	0.6 (1.3)	0	0.7 (1.5)	0.6 (1.0)	0.6	0.56	
Book thefts	0.9 (1.9)	**0**	**0.6 (1.3)**	**2.8 (3.1)**	**4.93**	*0.01*	H > ML
Preparation time	1.3 (3.2)	2.8 (6.2)	0.8 (1.7)	1.7 (3.8)	0.82	0.45	
Generic concerns	**8.3 (8.7)**	12.5 (13.1)	6.8 (7.2)	9.5 (9.2)	0.92	0.41	
Students	2.2 (3.1)	2.5 (4.3)	2.4 (3.2)	1.6 (1.9)	0.13	0.88	
Program	0.8 (1.9)	1.3 (2.9)	0.5 (1.8)	1.4 (1.4)	0.63	0.54	
Budget	1.4 (3.1)	3.1 (3.3)	**0.3 (0.8)**	3.4 (5.6)	**3.98**	*0.03*	LH > M
External aid	1.7 (3.1)	3.0 (4.4)	1.5 (2.9)	1.6 (2.4)	0.47	0.63	
Time-lines	2.2 (4.1)	2.7 (2.8)	2.2 (4.8)	1.5 (2.3)	0.12	0.89	
Principal's role	**11.5 (7.9)**	11.5 (14.3)	12.6 (6.8)	8.2 (3.5)	0.68	0.52	
Not Coded	**20.0 (8.3)**	22.5 (8.3)	21.0 (9.0)	15.7 (4.0)	1.1	0.35	

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precisely. Table 2 shows that only 15.7% of the TUs for principals in the High imputed expertise group were not assigned to topic elements in the analysis, the standard deviation being 4.0%. These are the lowest means and standard deviations in the Not Coded category for all comparison groups in both Table 1 and Table 2. Transcripts for principals in the High imputed expertise group were thus scored as having a higher proportion of on task TUs than any other group considered in this analysis.

Second, principals in the High imputed expertise group were also coded as having devoted the highest proportion of TUs (26.3%) to topic elements in the Library area. With an interesting exception, this extends a general trend which emerged earlier: the principals devoted greater attention to the Library area than did Other subjects, principals in the High expertise category devoting more attention to this area than other principals. The apparent exception to a smooth expertise related trend is the relatively high proportion of TUs (23.2%) devoted to the Library area by principals in the Low imputed expertise category. But while principals in the High and Low imputed expertise categories had the highest proportions of coded TUs in the Library area, these cumulative totals mask notable differences in the attention paid to the constituent topic elements in this area. As shown in Table 2,

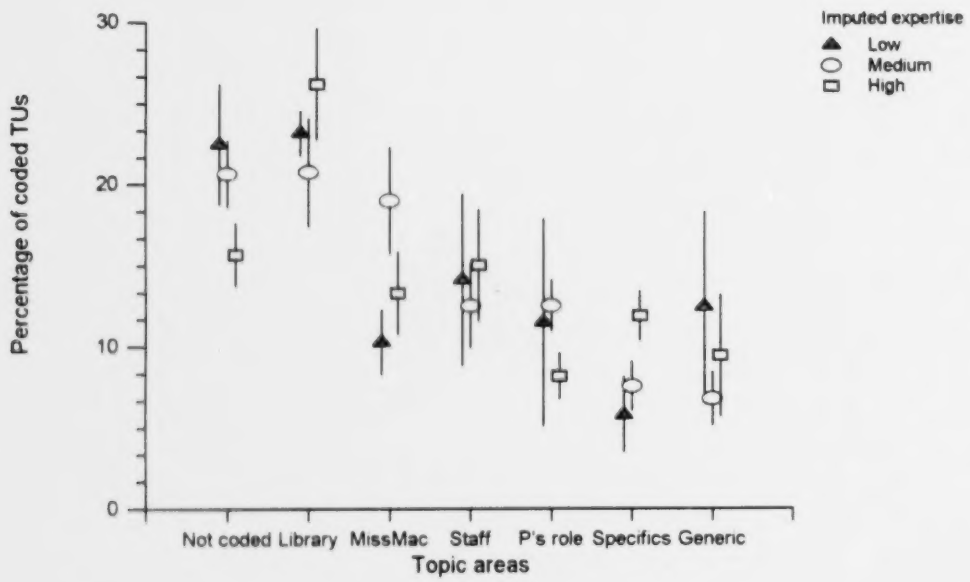

Figure 5

Error bar plot of TUs coded in topic areas by imputed levels of expertise for Principals

principals in the High imputed expertise group paid much greater attention to the purpose of the library (12.1%) and more attention to PtA policy (8.9%) than did principals in the Low and Medium groups. In contrast, principals in the Low expertise category paid greater attention than did principals in the other categories to the specifics of the Library schedule (3.2%), Library resources (4.5%), and facilities (1.8%). In the context of our theoretical framework, these differences can be explained by principals in the High expertise category generally being more aware of and interested in less obvious, more abstract, strategic elements of the case, while their colleagues in the Low expertise group appeared to be preoccupied with more immediate, concrete elements. Such differences in emphasis are in accord with schema theory as discussed more fully in the symposium papers dealing with our theoretical framework and our inquiry in the effects of cognitive complexity presented in a companion symposium paper.

Third, Figure 5 shows principals in the High imputed expertise group paying markedly more attention to the Specifics topic area. This is particularly intriguing given that the analyses reported earlier identified this as an area to which novice subjects paid more attention than principals. Inspection of Tables 1 and 2 shows that the topic elements in this area of most interest to principals in the High expertise group were Miss MacDonald's transfer and book thefts from the library. In both cases principals in the High imputed expertise category paid greater attention to these case elements than any of the other groups considered. No compact explanation for the greater attention paid to Miss MacDonald's transfer stands out in the data, although principals in the High expertise group tended to worry more about the background to her request for a transfer and to also express a willingness to facilitate any future such request that might be forthcoming, this last concern being a less common concern in other transcripts. The transcript data were much more informative on the matter of book thefts. As shown in Table 2, this was one of the three topic elements where a statistically significant difference was found across the imputed expertise categories. On average, principals in the High expertise group devoted 2.8% of their TUs to this topic element, while those in the Medium group had a mean of only 0.6%, and principals in the Low group completely ignored the issue. Examination of the TUs coded in this topic element showed that most principals classified in the High imputed expertise category were disturbed by the prospect of book thefts. They tended to suspect that this aspect of the case was probably a result of inaccurate record keeping or laxity, viewing the prospect of thievery as a serious matter which offended their values and would have a depressing effect on the school community. But

whatever the explanation, this was a matter which most principals in the High imputed expertise category said they would look into, whereas their colleagues in the Low imputed expertise group overlooked the matter entirely.

Fourth, Figure 5 shows that principals in the High imputed expertise category were least concerned with the role of the principal in the case. They did not ignore this element, as the mean of 8.2% of their TUs coded on this topic shows, but they did devote less attention to this issue than did their colleagues in the Medium and Low expertise groups. The long error bars for the Low imputed expertise group in this topic area (and the Staff and Generic areas) are of interest, showing considerable variation in the proportion of TUs coded in this (these) areas among individual principals in the Low expertise category, as is further illustrated by the high standard deviation(s) in Table 2. This is in sharp contrast with the short error bars for the High imputed expertise group in the Principal's Role topic area (and the Specifics area).

Table 2 shows two statistically significant differences in addition to that in the book thefts area already mentioned. Principals in the High imputed expertise group paid significantly more attention to the Staff disputes topic element than did other principals. In somewhat parallel fashion to the book thefts topic, principals in the High expertise group were particularly concerned with the prospect of open disagreement among their staff and typically said they would look into this and, if warranted, take appropriate action. Principals in the Medium expertise group evidenced much less concern over this case element, and most of those in the low expertise group ignored it.

The remaining statistically significant difference concerned TUs coded under the budget topic element in the Generic concerns area. In this case, the MCP analyses identified responses from both the High and Low expertise groups as being statistically different from the Medium group. This particularly interesting "H" pattern was mirrored—but not to such a marked degree—in the TUs coded in four other topic elements, as illustrated in Figure 6. In each instance, principals assigned to the Medium imputed expertise category paid less attention to these elements than did those in both the High and Low groups. In addition to the statistically significant difference in the attention paid to budget matters, Figure 6 shows that this patterned response is particularly clear for the Staff as a whole, the Library resources and program topic elements where principals in the High and Low groups paid roughly equal amounts of attention to these topics. Even so, the long error bars for many of the group means in these comparisons indicate substantial within group variation, compounded by the small group size in the

High and Low categories. In this context, the short error bars for the Medium group means for the budget, prep time and program topic elements are of interest, signalling higher levels of homogeneity within the distributions which, given the very low percentage of TUs coded on these elements for the Medium group shows that virtually every principal classified in the Medium imputed expertise category ignored them. Indeed, in the case of the budget topic element, only two of the 19 principals in Medium group were coded as articulating TUs concerned with this topic, as opposed to three of the five principals in the Low group and four of the six in the High group. Yet despite the quantitative similarities the level of attention paid to budget matters between principals in Low and High groups, examination of the TUs coded in this area revealed qualitative differences. A principal in the Low group, for example, said "You'd have to look at the budget to see whether or not you can go out as a principal and use the money available." In contrast, principals in the High expertise group tended to be more confident and direct about both investing and finding additional funds for the library. One, for example, declared "I'd want to make sure that in fact there had been enough resources put towards that library—financial resources—over the course of time," another that "I'd want to start pumping some money into this library."

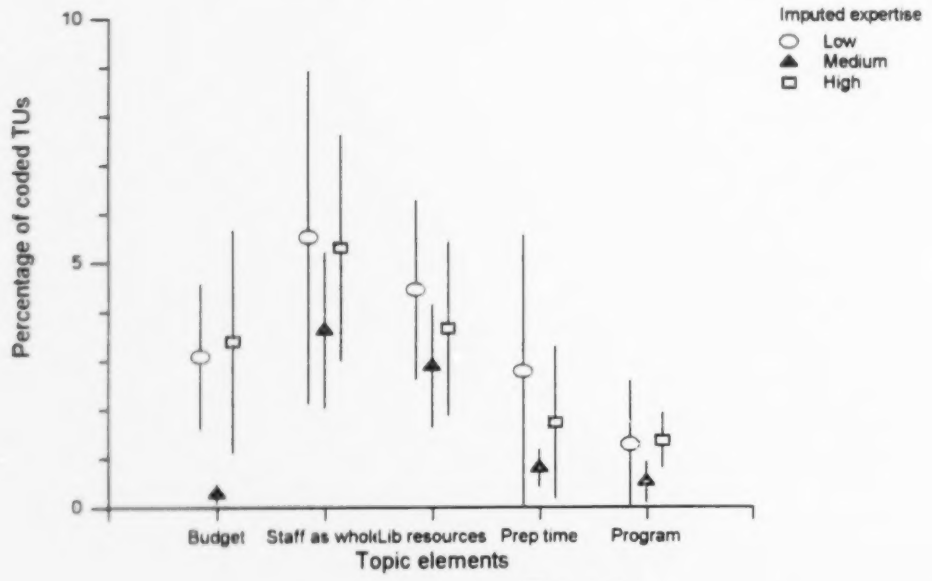

Figure 6

Error bar plots for topic elements with similar mean attention levels from members of both High and Low imputed expertise groups

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Summary

Across the full dataset, Principals paid greater attention to topic elements in the Library area, especially Library purpose and policy, than did the true novice subjects, whereas the novices directed greater attention to Specific elements, especially the Ms Green character and the reported "blow-up" with a library assistant. As a group, female participants appeared more interested in topics with personal and social dimensions, especially Miss MacDonald's needs and Staff needs and Staff involvement. Two interactions between participant Group and Gender were noted, male non-principals being coded as having directed greater proportion of TUs toward students and male principals as having paid greater relative attention the principal's role than any of the other Group-Gender pairs.

Table 3 offers a summary of differences associated with the imputed expertise categories. In this Table topic elements are ranked according to the relative proportion of TUs within each of the three expertise categories. The same three topic elements appear at the top of each column, but in differing orders. Whereas principals in both the Medium and Low expertise groups were coded as having paid the greatest proportional attention to the role of the principal in the case, those in the High group paid greatest attention the purpose of the library, followed by library policy, with principal's role occupying the third rank. Notable differences in the relative rank of topic elements listed in the main body of the Table are indicated by the use of various typefaces and trailing bullets. Thus, italics draw attention to the topic element of *Library schedule*, which was the seventh most frequently coded element for the Low group (3.24% of TUs), the eighth for the Medium group (3.26%), but only the 20th for the High imputed expertise group (1.42%). A frame has been drawn around the five topic elements at the bottom of the Low expertise column to draw attention to the lack of any TUs coded on these elements for principals in this group. Two elements in this set are shown as being of additional interest. The higher attention paid to library thefts by principals in the High expertise group has already been discussed. In contrast, the Ms. Green topic element attracted a higher level of attention from principals in the Medium group, those in the High expertise group devoting little attention to this topic. Finally, the last two rows of the Table draw attention to the previously noted trend in the proportion of TUs which were coded as not referring to any of the selected topic elements, principals in the Low expertise group having a higher proportion of Not Coded TUs than those in the Medium group who, in

Table 3
Ranked percentages of TUs coded on topic elements for imputed expertise categories

Low (N =5)			Medium (N = 19)			High (N = 6)		
Rank	Elements	%	Rank	Elements	%	Rank	Elements	%
1	Principal's role	11.55	1	Principal's role	12.56	1	Library purpose	12.06
2	Library purpose	7.4	2	PtA policy	7.79	2	PtA policy	8.95
3	PtA policy	6.36	3	Library purpose	6.41	3	Principal's role	8.21
4	Staff as whole	5.54	4	MM's SKILLS	6.14	4	MM's transfer	5.82
5	Library resources	4.46	5	MM's role	5.55	5	Staff as whole	5.32
6	MM's role	3.35	6	MM's needs	4.29	6	Staff disputes □	4.52
7	*Library schedule*	3.24	7	Staff as whole	3.63	7	MM's SKILLS	4.2
8	*BUDGET*	3.09	8	*Library schedule*	3.26	8	Library resources	3.67
9	MM's transfer	3.03	9	MM's transfer	2.93	9	MM's role	3.58
10	External aid	2.93	10	Library resources	2.9	10	*BUDGET*	3.4
11	Prep time	2.79	11	Staff needs	2.75	11	**Library thefts**	2.84
12	Staff PD ►	2.74	12	Ms. Green •	2.56	12	MM's future	2.52
13	Time lines	2.72	13	Students	2.35	13	MM's needs	1.85
14	MM's needs	2.6	14	Time lines	2.22	14	Prep time	1.74
15	Students	2.47	15	Individual staff	2.11	15	Individual staff	1.67
16	MM's SKILLS	2.34	16	MM's future	2.09	16	Students	1.64
17	Individual staff	2.15	17	Staff disputes □	1.72	17	External aid	1.59
18	MM's future	2	18	Staff involvement	1.71	18	Staff involvement	1.49
19	Library facilities	1.74	19	External aid	1.45	19	Time lines	1.49
20	Staff needs	1.67	20	Prep time	0.8	20	*Library schedule*	1.42
21	Staff involvement	1.31	21	Library blowup	0.71	21	Program	1.37
22	Program	1.29	22	Staff PD ►	0.64	22	Staff needs	1.12
23	Staff disputes □	0.74	23	**Library thefts**	0.59	23	Ms. Green •	0.98
24	**Library thefts**	0	24	Program	0.51	24	Staff PD ►	0.96
25	MM's agenda	0	25	MM's leadership	0.49	25	MM's agenda	0.64
26	Library blowup	0	26	MM's agenda	0.48	26	Library blowup	0.57
27	MM's leadership	0	27	Library facilities	0.43	27	MM's leadership	0.52
28	Ms. Green •	0	28	*BUDGET*	0.27	28	Library facilities	0.16
	Not coded	22.49		Not coded	20.66		Not coded	15.69
	Totals	100			100			100

turn, had a higher proportion of Not Coded TUs than principals in the High group, a pattern which suggests a direct relationship between on task thinking and imputed expertise.

Conclusion

The more detailed and thorough analyses reported in this paper both support and extend the main findings from the density analysis reported in the earlier Allison and Allison paper (1993). Principals in the High imputed expertise group attended to more of the sampled topic elements than did other principals *and* the true novice subjects. Yet while there was no difference between the *number* of topics thought about by the novices and the principals who were not classified in the High imputed expertise groups, the novices tended to focus on more peripheral topic elements than did the principals, who tended to concentrate on issues associated with library policy and operations. Such an emphasis was even more marked in the case of principals in the High imputed expertise group who tended to think at greater length about the purpose of the library and library policy than did other principals. And in addition to paying generally greater attention to these central topics, the more expert principals typically considered topic elements that were generally ignored by their colleagues, such as the issue of staff disputes, book thefts and budget concerns. These findings can be readily interpreted through the explanatory framework provided by schema theory, the more complex problem relevant schemata of the principals acting to direct their attention to more central elements of the case, and the even more richly constituted schemata of the more expert principals serving to help them recognize, relate and remember additional problem relevant elements

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